SOIL SURVEY OF THE CRAVEN AREA, NORTH CAROLINA.

By WILLIAM G. SMITH and GEORGE N. COFFEY.

LOCATION AND BOUNDARIES OF THE AREA.

The Craven area is situated in the eastern part of North Carolina, from 35 to 75 miles from the Atlantic Ocean, and touching Chocowinity Bay, an arm of Pamlico River, at its northeastern limit. The area consists of a rectangle with an east-and-west dimension of 29⅕ miles and a north-and-south dimension of 35 miles, making the area surveyed 897 square miles. The city of Newbern is situated in the area, about 8 miles from the southeast corner. Geographically the area lies between meridians 77° and 77° 30′ west from Greenwich, and parallels 35° and 35° 30′ north latitude.

Parts of six counties are included in the area, about four-fifths being composed of nearly equal parts of Craven, Jones, and Pitt counties, while the remaining one-fifth is composed of small parts of Beaufort,

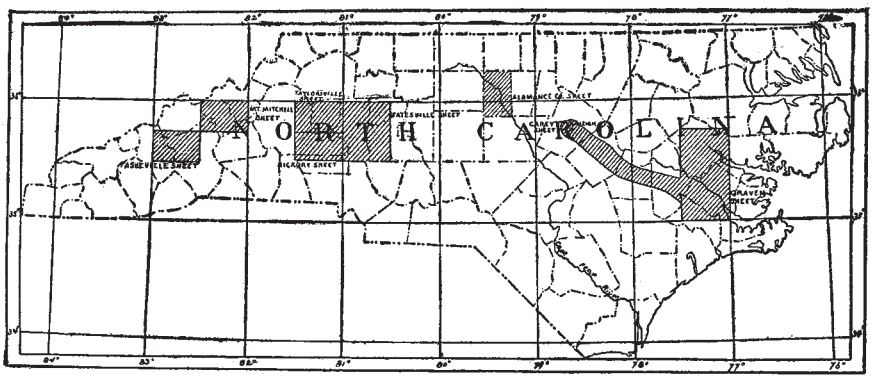

FIG. 9.—Sketch map showing location of the Craven area, North Carolina.

Lenoir, and Greene counties. About a third of the area, consisting of a strip nearly 9 miles wide, and lying along the Atlantic and North Carolina Railroad, was surveyed by the Division of Soils in 1900 and published as a separate map, while the remainder was surveyed a year later, the map being published to accompany this report. Ordinary road maps were used as bases for these earlier surveys, but in 1903 the United States Geological Survey was able to supply, in advance

of publication, a very good topographic base map of the whole area, and a party from the Bureau of Soils was detailed to review the early surveys and adjust the soil types to this new base. The department of agriculture of North Carolina cooperated in the work and bore the expense of making the base maps.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

According to the best information obtainable the first settlers in the area came about 1707, and settled along the Neuse and Trent rivers. They were French Huguenots who came from Virginia. The first settlement was made at James City, but the colonists soon moved across the river and called the city which they founded Newbern. The English gradually came in later until they formed the majority of the population. From Newbern the settlement spread out over the surrounding areas.

The plantations were almost invariably located near the streams, so as to have the advantage of water transportation. The principal crops were corn and tobacco. Wheat, barley, and oats were also grown to some extent. Almost every planter had his own vegetable garden. Fruits, both cultivated and wild, were not wanting. Large quantities of naval stores were gathered, and many gallons of wine were made. The mildness of the climate and abundant natural pasturage furnished an opportunity for the raising of stock. Cotton, it is claimed, was one of the early crops, but it was not produced in any quantity until after the civil war. Upland rice was formerly grown in considerable quantities, but its cultivation has been discontinued. As plenty of virgin land was obtainable, little attention was given to maintaining the productiveness of the fields.

Before the civil war nearly all the land was owned by wealthy planters, one man often owning many thousand acres. The war, however, wrought a great change in the social and economic conditions, and farm labor became so scarce that large areas had to be abandoned, some of which have never been reclaimed. The tendency was to break up the large plantations into smaller farms.

Soon after the war cotton began to be one of the staple products. The introduction of bright tobacco and the growing of truck have been a great stimulus to the agriculture of the entire section. The growing of the first bright tobacco in the area was undertaken, according to the best information, at Vanceboro, in 1886. The barn containing the best of it was burned, and no further attempt was made to grow it until 1890. Since then its production has increased very rapidly. Trucking upon a large scale has also been undertaken within the last few years, and has had a decided influence upon the development of this section.

CLIMATE.

The climate of the area is determined by its situation in the warm Temperate Zone, but is modified to some extent by other factors. Although the area surveyed neither borders on the ocean nor contains large bodies of water, the effect of the proximity of the ocean and the bays and sounds that indent the coast is evident in the increase in precipitation, as well as in the lessened fluctuation of temperature, both diurnal and seasonal, as compared with that of other areas farther inland. The modifying influences of broad rivers, like the Neuse at Newbern, also have an appreciable effect upon the climate and lessen the danger from late and early frosts. By examining the following table it will be seen that there is an average of nearly seven months in the year in which no killing frost occurs:

Dates of killing frosts.

	Last in spring.	Average date.	First in fall.	Average date.
Newbern, N. C.	Apr. 11, 1892	Apr. 1	Oct. 10, 1895	Nov. 4

The winters are usually mild, the normal temperature for January, the coldest month, being 42.6° F., and even when uncommonly cold they are characterized by abounding sunshine, which is so essential in the growing of vegetables. The winters are, however, mild enough to permit the cultivation of many vegetables in cold frames covered with loose sashes only at night and on especially cold days. Snow falls, but remains upon the ground for a short time only.

The following table shows the mean monthly temperature and precipitation at Newbern, the only Weather Bureau station in the area, and also the precipitation at Greenville, a point a few miles northwest of the area, and represents normals for twenty-one and nine years, respectively:

Normal monthly and annual temperature and precipitation.

Month.	Newbern.		Greenville (precipitation).	Month.	Newbern.		Greenville (precipitation).
	Temperature.	Precipitation.			Temperature.	Precipitation.	
	°F.	*Inches.*	*Inches.*		°F.	*Inches.*	*Inches.*
January	42.6	4.25	3.77	August	77.3	8.08	7.10
February	47.0	4.08	2.89	September	72.9	5.45	5.00
March	51.6	4.01	4.65	October	61.9	3.59	3.31
April	59.6	3.72	4.49	November	53.4	3.27	2.57
May	68.4	4.44	3.88	December	46.1	3.37	3.13
June	75.9	4.75	4.00	Year	61.3	56.08	49.88
July	78.9	7.07	5.09				

It will be seen that the rainfall is fairly uniform throughout the year, and that during those months when growing crops require the

most moisture the amount is greatest, and that the least amount occurs in those months when the farmers need favorable weather for the harvesting of their crops. The annual relative humidity is about 75 per cent, the maximum occurring in July and August.

PHYSIOGRAPHY AND GEOLOGY.

The surface of the area is that of a plain, the highest points of which are less than 80 feet above the level of the sea, and the average elevation about 30 feet. As the country was gradually uplifted from beneath the sea, erosion began, and in the larger streams almost kept pace with the uplifting, so that to-day there is little difference in the elevation of these streams in the upper and the lower portions of their courses through the area, and tide water extends the greater part of this distance. These streams are usually bordered with strips of low, wet, swampy land, which is covered with water during high tide, and is unfit for cultivation. There is generally a gradual slope from the streams back to the level uplands, where large areas are found which vary little from a perfect level, although the surface is usually broken by slight undulations. Terraces are sometimes found along the streams, and in the vicinity of Grifton these rise rather abruptly to an elevation of from 50 to 70 feet. Facing Choccowinity Bay there are bluffs 30 feet in height, and the cutting of the streams through these bluffs has given to this part of the area a rather hilly topography. One of the most striking topographic features is the presence upon the divides of large swamps or pocosons, some of which extend for many miles and contain many thousand acres. The country in general is low and level, and small swamp areas are of frequent occurrence. To this feature is due the two great soil type groups, the Norfolk series and the Portsmouth series.

The soils of the entire area were deposited during recent geologic time. The Potomac formation was laid down on an irregular bed of granite and slates, with the Upper Cretaceous, Tertiary, Lafayette, and Columbia formations above it, the last being the youngest. The shell-rock formations, which are found along both the Neuse and Trent rivers, and within a few feet of the surface a few miles above Newbern, are of Eocene age. The semilithified shells, exposed in some instances along the Neuse River and to be seen at low water, are Cretaceous. The surface deposits on the lower levels belong to the Columbia formation, and, in the higher levels, around Grifton and Ayden, to the Lafayette or late Tertiary. The marl beds which underlie a large part of the area are Eocene, Miocene, or Cretaceous. Practically all these marls have some manurial value, but usually the percentage of lime which they contain is so small, being mixed with so much earthy material, that it does not pay to transport them to any considerable distance, or to excavate them if they occur several feet below the sur-

face. Some of these marls contain from 1 to 2 per cent of potash, and as much or slightly more phosphate, and both these ingredients increase their value as fertilizers.

SOILS.

There are eight distinct types of soil in the area, exclusive of Swamp. The extent of each of these is given in the subjoined table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Swamp	188,288	32.8	Portsmouth sand	11,072	1.9
Norfolk fine sandy loam	155,136	27.0	Selma clay	9,600	1.7
Norfolk sand	88,192	15.4	Neuse clay	1,792	.3
Portsmouth sandy loam	46,208	8.1	Total	573,080	.....
Portsmouth clay	45,504	7.8			
Norfolk sandy loam	27,288	4.9			

NORFOLK SAND.

The Norfolk sand is made up very largely of quartz sand mixed with a small percentage of silt, clay, and organic matter, the largest amount of which is found in the low places where swampy conditions formerly prevailed. This sand extends to a depth of not less than 3 feet, and frequently to 10 feet, and is underlain, as was noted in road cuts and along streams, by a heavy yellow loam or clay. The soil varies in texture from a coarse to a fine sand, and along the upper course of the streams it occasionally contains a small percentage of fine gravel. It is open, loose, and porous, and a few instances were noticed where it had been shifted by the wind. Deep sandy roads are characteristic of this type of soil. The color varies from a very light to a very dark gray, depending upon the amount of organic matter present. The first few inches are often bleached, and are underlain by a pale-yellow, gray, or white sand, which is similar in texture to that above. The following analyses show the character of the material composing the Norfolk sand:

Mechanical analyses of Norfolk sand.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
6251	Trenton	Sand, 0 to 36 inches.	0.56	0.54	1.73	3.28	65.55	22.18	4.14	2.56
6250	1 mile E. of Whitford.	Gray sand, 0 to 36 inches.	.38	.57	4.40	13.57	60.95	8.34	8.90	3.26
6252	¾ mile NE. of Grifton	Sand, 0 to 36 inches.	.91	.12	2.12	8.18	68.78	10.91	6.28	3.60

The Norfolk sand is an extensive and important soil type. It is found along the Trent and Neuse rivers and Contentnea and Swift creeks, sometimes as much as 3 miles distant from the streams, and usually at elevations of less than 20 feet above them. It also occurs to some extent as low ridges in the upland. Some of the lower areas are overflowed during high floods. The surface is sometimes level, but is more often gently rolling, being made up of a succession of low ridges and knolls. A terrace occasionally marks the boundary of the Norfolk sand and the Norfolk fine sandy loam. Low places which require artificial drainage are of not unfrequent occurrence, but usually the soil possesses good drainage, owing to its rather open texture, and, in fact, the higher areas often suffer during droughts because of the great depth to the water table. Careful cultivation and intensive manuring, however, do much to increase the capability of the soil to retain moisture.

The Norfolk sand in this area owes its origin mainly to stream and tidal action. The streams and rain water have been active in washing out the clay and finer particles of material along the valley sides, leaving behind the sand, while near sea level the sand has again been reworked by tides and waves, which have formed it into low, flat terraces and ridges. Sometimes the type occurs in the uplands, far removed from any large stream, in which case it represents a shore-line deposit, made during earlier geological times, when this area was in whole or in part beneath the Atlantic Ocean. As a rule these deposits are rather flat.

The mineral constituent of the type is largely quartz sand, which, in some cases, is stained slightly with iron salts and vegetable mold.

The development of the trucking industry and the introduction of bright tobacco have greatly increased the value of the Norfolk sand for agricultural purposes. Its small percentage of clay, unretentiveness of moisture, and early warmth make it admirably adapted to the growth of early truck, and where rapid transportation is possible it is largely so used. It is the typical early truck soil. In the greater proportion of the area, however, the growing of early vegetables is at present not practicable, owing to the lack of shipping facilities, and here tobacco forms the leading crop. The yield per acre is not as great as upon the fine sandy loams, but the tobacco is of a superior quality. Corn and cotton are also important crops, and in the low places do well, but the soil is usually too light and porous for either of these to yield very remunerative crops. Sweet potatoes succeed admirably, and the cowpea yields large returns and is very beneficial to the land. The soil is not naturally very productive, is subject to drought, and leachy, and manures are very beneficial. Under the best conditions, where the water table is near the surface and the soil is heavily manured, corn yields from 40 to 60 bushels per acre and

cotton 1 bale per acre, but the average yields are usually from one-fourth to one-half as much as these maximum yields.

The original forest growth contains a much larger proportion of hardwoods, such as oak, hickory, dogwood, etc., and longleaf pine, than does the growth on the Norfolk fine sandy loam. The greater part of the longleaf pine has, however, been removed. A large part of this type has at some time or other been under cultivation, but much of it has been abandoned. Owing to the introduction of the early truck and tobacco industries there is now a tendency toward reclaiming it.

NORFOLK SANDY LOAM.

The soil of the Norfolk sandy loam is a loose, porous, mellow, fine sandy loam from 18 to 36 inches deep. The deeper and more sandy phases are found upon the low ridges, and, as in the case of the types just described, the low places are wetter and heavier. It is lighter, deeper, and more sandy in character than the Norfolk fine sandy loam. The color of the surface is gray, but this soon changes to a pale yellow below the surface. The soil is underlain by a heavy, reddish-yellow sandy loam or loam, in which the silt or clay content gradually increases with the depth, and in which pockets of gray sand often occur. The subsoil is very friable, and crumbles easily in the hand. At a depth of about 10 feet it is underlain by a layer of stiff, impervious drab clay.

The following table gives analyses of samples of the Norfolk sandy loam:

Mechanical analyses of Norfolk sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
6237	1 mile W. of Redallia.	Fine sandy loam, 0 to 36 inches.	0.44	0.84	3.17	5.56	63.15	11.59	10.68	5.04
6240	¼ mile N. of Ayden.	Fine sandy loam, 0 to 18 inches.	.52	.21	1.42	2.82	59.77	12.50	17.81	5.93
6238	¾ mile N. of Hanrahan.	Fine sandy loam, 0 to 18 inches.	.83	.10	.57	1.67	42.15	13.85	24.44	17.22
6239	Subsoil of 6238....	Fine sandy loam, 18 to 36 inches.	.55	.45	.49	1.74	40.15	12.55	21.80	22.85
6241	Subsoil of 6240....	Reddish-yellow loam, 18 to 36 inches.	.50	.62	1.41	3.06	45.48	8.85	12.86	27.75

The local variations in this soil are not great. Sometimes the sand is coarser and the texture more loose and open, and again the sand is finer and the texture becomes rather close and heavy. In small depressions and flat upland areas the gray color of the surface soil

becomes much darker, owing to the larger proportion of organic matter present in such locations, but this does not often affect the soil below 6 or 8 inches.

The Norfolk sandy loam occupies a large area around Ayden, and covers almost the entire northwestern corner of the Craven sheet. It is found on the uplands at elevations of from 50 to 70 feet. Its southern boundary is marked by a terrace from 15 to 30 feet high, and the surface here is somewhat broken. The surface, however, is generally level or slightly undulating. Both the surface configuration and the texture of the soil tend, in the majority of cases, to afford adequate drainage. In very wet seasons of the year, however, in areas that are comparatively flat the soil becomes saturated with water, which sometimes stands on the surface. The presence of the impervious clay substratum at a depth of 10 feet probably promotes this condition. Most of the areas requiring artificial drainage can easily be improved by the use of open ditches, which need not be placed very close together.

The Norfolk sandy loam owes its origin to a marine deposition of sand and clay. These materials came originally from the Piedmont Plateau, from which they were transported by the streams. The clay substratum probably marks a stage when the area was submerged to a considerable depth, while the sandier surface deposits seem to have been laid down at a much later time, after the area had been nearer the surface of the water, bringing it under the influence of tidal and wave action. Since the final uplift the rains have doubtless removed some of the finer particles, but the agencies previously suggested have probably been the main factors in the formation of the type.

The Norfolk sandy loam is a good type of soil for the crops grown in this section. The lighter, deeper, and more sandy ridges are well adapted to the production of bright tobacco, and as much as 1,000 pounds per acre have been secured, though the average is not over 700 pounds. It also produces good crops of cotton, the average yield being about one-half bale per acre. The sweet potato flourishes and is of excellent quality. Irish potatoes, peanuts, and late truck all yield profitable returns. This soil is too light for corn to succeed well, and 10 bushels per acre probably represents the average yield. It produces best in the low, heavier places. The yield of crab-grass hay ranges from 1 ton to 2 tons per acre. The tree fruits do fairly well, but are grown mainly for home consumption. The small fruits are successfully produced.

The Norfolk sandy loam is largely in cultivation, and some of the finest farms in the area are located upon it. The value of these ranges from $5 to $25 an acre. The effect of manures is not as lasting as upon the Norfolk fine sandy loam, but by a judicious use of fertilizers, more systematic rotation of crops, and the growing of more leguminous plants, it can be made quite productive.

NORFOLK FINE SANDY LOAM.

The surface soil of the Norfolk fine sandy loam is a fine sandy loam varying in depth from 8 to 18 inches, with an average depth of 12 inches. The percentage of fine sand varies in different localities. In level, low-lying places more silt and clay are mixed with it, and the soil is consequently heavier. Near the Norfolk sand it is lighter, deeper, and contains more sand, which is, in all cases, composed almost entirely of quartz. Where erosion has been active, spots from which the soil has been largely removed were observed, and it was noted that these spots baked, were difficult to till, and were not very productive. The soil is commonly gray or yellowish in color, which, however, depends largely upon the amount of organic matter present, becoming darker as this increases. The subsoil is a rather stiff, yellow or mottled-yellow clay, containing a considerable proportion of sand, which in some instances is sufficient in quantity to render it lighter and less incoherent. Where this latter character of subsoil is found the texture of the surface soil is also lighter. This phase is found near the boundary between this type and the Norfolk sand. While the subsoil of the Norfolk fine sandy loam is rather stiff and does not permit a free percolation of water, still it is not so hard and impervious as the subsoil of the Neuse clay, nor on the other hand is it so light and porous as that of the Norfolk sandy loam.

The following table shows the texture of the Norfolk fine sandy loam:

Mechanical analyses of Norfolk fine sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
6253	2 miles S. of Newbern.	Fine sandy loam, 0 to 10 inches.	1.28	0.10	0.41	0.51	27.00	26.95	26.54	8.58
6257	3 miles N. of Vanceboro.	Fine sandy loam, 0 to 12 inches.	1.00	.25	.84	.61	14.58	17.45	51.09	15.18
6255	1½ miles N. of Polloksville.	Fine sandy loam, 0 to 8 inches.	.86	1.23	3.88	3.09	13.60	14.70	47.35	16.20
6258	Subsoil of 6257....	Light yellow clay, 12 to 36 inches.	.61	.10	.23	.25	10.33	16.52	42.40	30.20
6254	Subsoil of 6253....	Yellow clay, 10 to 36 inches.	.58	.00	.19	.04	18.73	13.79	29.00	38.27
6256	Subsoil of 6255....	Clay, 8 to 36 inches.	.20	.25	1.15	.94	7.80	5.05	36.00	48.82

The Norfolk fine sandy loam is the most extensive and most important agricultural soil type found within the limits of the present survey. It occurs in broad, extended areas in the upland at elevations of not

less than 20 feet above sea level. Its greatest development is north of Vanceboro, and it is also found in large areas near Polloksville, Trenton, and Grifton. The type is best developed along streams where drainage is good. Thus it may occur between streams that are not far apart, or it may occur as a sort of border extending from 1 to 5 miles back from the stream until it is lost in some of the flatter and poorer-drained types, such, for instance, as the Portsmouth clay. The surface is generally level or slightly undulating, and sometimes, along the streams, gently rolling, while near Choccowinity Bay it is somewhat hilly. The surface is also hilly in places next the larger streams, where the valley escarpments often rise abruptly to a height of 30 feet. There are also here and there steep-sided gullies extending back from the stream into areas of the soil, which break its general level or gently rolling surface and interfere to a slight extent with its use for agriculture.

The type is as a rule quite well drained by streams, although extensive flat areas exist somewhat remote from the larger streams, which require considerable ditching before they can be profitably cultivated. Usually this is not very difficult, as some natural drainageway can nearly always be found to which the ditches may conveniently be joined.

As in the case of the preceding type, this soil owes its origin to marine sedimentation, the materials deposited being derived, through surface washing and stream erosion, from the Piedmont Plateau.

The Norfolk fine sandy loam is the best type of soil for general farming purposes found within the area. Almost all crops grown in this section can be produced upon it. It is an excellent cotton soil, and, under favorable conditions and proper cultural methods, it will yield 1 bale of cotton per acre, and indeed this might be made the rule with a wise system of rotation and a judicious use of fertilizers and leguminous crops. The average yield, however, is about one-half of this quantity. The lighter phases produce a fine quality of lemon-yellow tobacco, and yield from 500 to 1,200 pounds per acre, depending largely upon the quantity of fertilizer used. Corn does fairly well, and crops of from 10 to 20 bushels are harvested from an acre. Late truck is also grown with success, but the soil is too heavy for early truck. Cowpeas and grass yield good crops of hay and improve the lands. The clay subsoil serves as a good base for the retention of fertilizers, and this type can be brought to a high state of cultivation and made quite productive.

A large percentage of the Norfolk fine sandy loam is still in timber. This is especially the case in the area north of Vanceboro. Here one can travel for miles through an almost unbroken forest. The principal forest growth is the loblolly, or, as it is more commonly called, the shortleaf pine. In all, possibly a third of this type is under cultivation. The average value of the improved land ranges from $5 to

$25 an acre. The forested areas, where there is a stand of merchantable timber, bring much more than this.

SELMA CLAY.

The Selma clay consists of from 3 to 9 inches of clay loam containing some very fine sand and much silt, underlain by stiff mottled yellow clay. If plowed when too wet the soil forms clods, which do not readily disintegrate, or if allowed to dry without cultivation the surface compacts and is very difficult to pulverize. The surface layer is usually so shallow that the plow reaches the clay subsoil, and it is this that gives the type its clayey character. It is often spoken of locally as "clay land."

The Selma clay occurs in the southern part of the area around Polloksville, and usually lies adjacent to the heavier phases of the Norfolk fine sandy loam. The surface is almost always flat, the natural drainage is poor, and artificial drainage is necessary before crops can be successfully grown. This, however, is readily effected by means of open ditches.

The materials composing this type were deposited by the ocean waters during the period of submergence of this area, and the type has probably about the same texture now as it had at the time of the final elevation. The areas are too flat to permit the clay and silt particles being removed by the wash of rain waters, as in the case of the Norfolk fine sandy loam.

The mineral constituents of this type are doubtless much the same as those of the Norfolk fine sandy loam, being originally derived from the decomposed granites, gneisses, and other crystalline rocks of the Piedmont Plateau.

Cotton, corn, Irish potatoes, grain, and forage crops produce very well where the surface soil is kept in good tilth. Plowing under green manuring crops is very beneficial, for unless great care is taken the soil settles into a plastic mass after heavy rains, and upon drying becomes compact and refractory. The addition of organic matter tends to correct this. When well cultivated this soil yields a bale or more of cotton, from 20 to 50 bushels of corn, and from 1 ton to 2 tons of hay per acre. Under the cultural methods ordinarily followed only about half of these yields are secured.

The type seems very well adapted to the crops named. On the areas having the most perfect drainage late truck crops produce well, but as a whole the type would seem better adapted to corn, grain, and forage crops, especially if grown in conjunction with stock raising.

About a fifth of this type is under cultivation, while the remainder is timbered with pine. Its value is somewhat lower than that of the types already described, ranging, where improved, from $3 to $10 an acre. The heavily forested areas bring higher prices than this.

The following table shows the texture of the soil and subsoil of this type:

Mechanical analyses of Selma clay.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
6248	5½ miles NW. of Fort Barnwell.	Fine sandy and silty loam, 0 to 9 inches.	2.33	3.78	10.15	7.50	8.95	7.85	41.85	19.90
6249	Subsoil of 6248.....	Stiff, impervious clay, 9 to 36 inches.	.74	2.06	6.95	5.07	5.65	5.97	31.30	43.00

NEUSE CLAY.

The Neuse clay consists of a surface soil of dark-gray mottled clay, from 4 to 6 inches deep, underlain by a subsoil of sticky mottled grayish-yellow clay, reaching to a depth of 3 feet or more. Occasional areas of this type may be slightly silty, or even sandy, but as a rule the type has a marked clayey character.

This soil occurs almost invariably in the lower bottom lands along the Neuse River and some of its larger tributaries. It usually lies from 5 to 25 feet above the normal level of the streams and is subject to overflow. It is locally called "river swamp" land.

The natural drainage is usually poor. The surface is quite flat, and next the streams is frequently slightly higher than farther back. This forms a natural levee which prevents drainage of the surface water to the streams. The forest growth which covers much of the area also checks the free movement of water. By means of open ditches much of the type could be drained when the streams fall to their normal stage.

The Neuse clay owes its origin chiefly to a slow deposition of fine silt and clay during periods of overflow. It has also been formed to some extent by the washing in of silt and clay from the adjoining upland during heavy rains.

The rather limited extent of the type—it being usually confined to a terrace from one-eighth to 1 mile in width—does not warrant the building of levees, so that ditching, with a view to carrying off the overflow waters quickly, and growing crops that will mature between the periods of overflow, seem to be about the only improvements that can be looked forward to on this type. Those areas lying above stream floods, of course, have a longer period of utility. But in either case not much of the type is yet under cultivation, most of it still being forested with water oak and gum, and in some cases with cypress.

This soil is used largely as pasture for cattle and hogs, for which purpose it serves quite well, the undergrowth of shrubbery and wild

grass affording good feed. The river terrace areas of the type could be used for growing cotton, corn, and forage crops, as these can be seeded after danger from spring floods is past, while the higher lying areas could be used for the same crops and to greater advantage, since there is not so much danger from overflow during winter and spring. Careful attention to drainage would in all cases have to be given.

PORTSMOUTH SAND.

The Portsmouth sand consists of from 8 to 15 inches of sand mixed with varying quantities of organic matter, in some instances the soil being quite mucky, while in others it may be so free from vegetable mold as closely to approach the Norfolk sand in texture. The subsoil is usually a loose grayish-yellow sand, although it sometimes is stained a darker color by decaying vegetation. It may also have a slightly clayey texture in areas bordering the clay soils.

The type occurs principally in one body, 16 square miles in extent, about 10 miles north of Vanceboro.

The following table gives mechanical analyses of samples of the Portsmouth sand:

Mechanical analyses of Portsmouth sand.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
6242	6 miles N. of Vanceboro.	Sand, 0 to 36 inches	0.91	0.18	3.68	13.72	66.12	3.11	5.90	7.33
6243	10 miles N. of Vanceboro.	Black sand, 0 to 12 inches.	1.34	Tr.	6.06	19.37	54.75	2.49	10.02	7.35
6244	Subsoil of 6243....	Yellow sticky sand, 12 to 36 inches.	.64	.53	9.55	22.00	46.50	2.21	10.15	9.05

North of Vanceboro, upon the divide between the Neuse and Pamlico rivers, at elevations of from 40 to 70 feet, is found the large area of this type of soil. The surface here consists of low, broad, almost level ridges, in which occur depressions from a few yards to 200 yards in diameter, and from 2 to 6 feet below the general level. The depressions contain water and a thick growth of bay and gallberry bushes, and are very similar in character to the "baybush pocoson" phase of the swamp. The water table is often within 2 or 3 feet of the surface, and, in fact, during rainy seasons a large proportion of the surface is covered with water. This is due to the generally level surface.

The Portsmouth sand is almost entirely in forest, and practically no effort has been made to bring it into cultivation. The forest consists of a sparse growth of pines, at one time chiefly longleaf, and a few scrub oak. The ground is covered with a thick matting of wire grass and a scattering growth of bay and gallberry bushes. The few small areas in cultivation produce a very good quality and fair yield of bright tobacco. Fields of cotton and corn were also noted, but these crops do not yield very profitable returns, except in the small depressed areas. If properly drained, this soil should be well adapted to the growing of bright tobacco and truck. The lack of rapid transportation facilities precludes it from being extensively used for the latter purpose at the present time. The value of the land of this soil type, where the pine has been removed, ranges from $1 to $5 an acre.

PORTSMOUTH SANDY LOAM.

The Portsmouth sandy loam consists of from 10 to 20 inches of rather coarse, loose dark-gray sandy loam, underlain by a mottled gray and yellow sandy clay subsoil. Some phases of the type have the property of forming into a rather compact surface, and by the survey of 1900 the type was correlated with the Goldsboro compact sandy loam. It is now regarded as belonging to the Portsmouth series.

The Portsmouth sandy loam is nearly always found bordering swamp areas of the pocoson variation. The surface is quite flat and the natural drainage poor. It lies only from a few inches to 10 feet above the surrounding pocoson and savanna lands and in its natural state was subjected during much of the year to swamp conditions. It is this that has given the type its dark color and high organic matter content. But this type, like the one last described, can in nearly all cases be used for cultivation after drainage by means of open ditches, and much of its area has already been reclaimed in this way.

As these ditches are extended much of the area formerly termed "pocoson" is being brought under cultivation. The area of the Portsmouth sandy loam is being added to from year to year by this means.

Like the preceding types, this one owes its origin to materials deposited during the submergence of this region beneath the Atlantic. The very sandy character of the upper 1 or 2 feet would seem to indicate that the type lay in the path of the prevailing shore currents, occasioned by the tides and waves, which operated to carry away the fine silt and clay particles. The materials forming the soil were originally derived from the Piedmont Plateau.

Cotton, corn, and hay and other forage crops produce well on this soil, as do many of the truck crops, such as sweet and Irish potatoes, cabbage, etc. Small fruits are also grown successfully. Near Newbern, where the type is well drained and heavily fertilized, the staple

crops as well as the truck and fruit crops give remarkably large yields. Here cotton yields from 1 to 2 bales per acre, corn from 40 to 80 bushels, hay from 1 to 2 tons at each cutting, and the vegetables and small fruits in like proportion. Outside of the Newbern district the normal yields are usually not more than one-half or one-fourth of those stated.

The greater part of this type is cleared and under some form of cultivation. That still unimproved is mainly land from which the merchantable timber has been cut. Even this will probably be brought under cultivation as rapidly as artificial drainage can be extended. The natural productiveness of this sandy type, together with its easy cultivation, makes it very attractive to the farmer.

Some well-equipped farms are seen on this soil. Its value ranges from $5 to $25 an acre, or about as high as that of any other soil in the area.

The following table shows the texture of typical samples of this soil:

Mechanical analyses of Portsmouth sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
6246	6 miles W. of Trenton.	Sandy loam, 0 to 18 inches.	0.97	1.34	3.37	2.51	51.25	10.12	26.45	5.01
6245	2½ miles SW. of Fort Barnwell.	Sandy loam, 0 to 30 inches.	2.05	14.90	20.87	15.13	14.52	3.89	16.04	14.72
6247	Subsoil of 6246....	Mottled yellow sandy clay, 18 to 36 inches.	.47	.47	1.72	1.74	43.15	9.43	30.60	12.93

PORTSMOUTH CLAY.

The Portsmouth clay, for from 3 to 9 inches below the surface, consists of a black, mucky soil which has gradually accumulated from decaying vegetation. This grades into a gray or dark-gray fine sandy loam, mixed more or less with silt and extending to a depth of from 6 to 15 inches. It is underlain by a stiff, sticky yellow or mottled-yellow clay subsoil. This type resembles the Norfolk fine sandy loam in texture, but differs from it in that the soil contains more organic matter and the subsoil is more sticky and impervious. There is the greatest difference, however, in the natural vegetation on the two types. The Norfolk fine sandy loam has a heavy growth of pine, while the forest on the Portsmouth clay is much more open and the ground is covered with a thick matting of wire grass, broom sedge, and a scattering growth of huckleberry, gallberry, and other shrubs.

The following table shows the texture of the soil and subsoil of this type:

Mechanical analyses of Portsmouth clay.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
6260	7 miles S. of Newbern.	Fine sandy loam, 0 to 12 inches.	4.82	Tr.	4.54	10.53	21.33	5.60	50.20	7.88
6261	Subsoil of 6260.....	Stiff sticky clay, 12 to 30 inches.	.87	0.33	3.76	9.20	16.10	5.78	44.53	20.30

The Portsmouth clay almost invariably occurs in the flatter areas skirting the Norfolk fine sandy loam, often lying between the latter type and the upland swamp areas. The surface is flat and the natural drainage very poor. To enable cultivation artificial drainage is required over the entire area, and in order to secure this it would be necessary to cut large ditches or canals to some distant stream. This would involve considerable expense and the cooperation of the landowners, and there seems to be little indication that any great extent of these areas will be brought into immediate cultivation. There are relatively small areas where reclamation is not very expensive, as open ditches a foot to 2 feet in depth frequently suffice, these being led into some natural drainage channel at no great distance.

The type owes its origin to materials deposited from ocean waters during the period of submergence of the area. These materials came primarily from the Piedmont Plateau area, being composed of the weathered products of granite, gneiss, and other crystalline rocks. The texture of the type is probably much the same now as when first laid down, though it has been modified to some extent by the existence of more or less swampy conditions.

No very great extent of this type is as yet under cultivation, but as drainage becomes more extended most of it will doubtless be used, as it is naturally productive. A bale or more of cotton per acre, and from 20 to 40 bushels of corn, are sometimes secured from this soil. Good yields of hay and other forage crops are also produced. Where good drainage is had, and careful cultivation is given, the truck crops and small fruits may be profitably produced.

The average value of lands of this type ranges from $3 to $15 an acre, but higher prices will doubtless soon prevail as the land becomes drained and otherwise improved. Much of the type is covered with merchantable pine, and such areas bring higher prices.

The type when improved is well adapted to the crops just mentioned. Its adaptation is quite wide—almost as wide as that of the Norfolk fine sandy loam, while its natural productiveness is, of course, greater.

SWAMP.

The term Swamp is used in the Craven area to cover three varieties of swampy land. The most important, at least as regards extent, consists of those areas locally known as "pocoson." This name is usually applied to the large swampy areas which are found upon the divides between the large streams. The "pocoson" areas differ from the ordinary swamp land in that they are neither alluvial nor subject to overflow.

There are three large pocosons, parts or all of which occur within the area surveyed. Two of these extend for several miles beyond the limits of the present survey. Trenton lies between two such areas. The one on the north is known as the Dover Pocoson, while the other to the southwest is called the Onslow Pocoson. The Big Pocoson is situated in the northeastern part of the area. Another smaller one is found near Maple Cypress, and owing to the large number of bay bushes present is known as the Baybush Pocoson. Others of less extent occur in almost all sections of the area.

The level surface is broken only by low ridges that rise from 2 to 5 feet above the surrounding area. The surface is, in fact, so flat that it is covered with water the greater part of the year. As the usual elevation is from 30 to 50 feet above sea level, these areas will generally admit of drainage, and no type in the area presents as interesting a field for drainage engineering as does the pocoson. This can be accomplished by the construction of canals or ditches from the center of the swamp to some of the larger streams, or by cleaning out the natural drains. The latter method will probably prove cheaper wherever it is practicable. There are large tracts, however, which are so level that no natural drainage ways have been formed. The construction of such extensive drainage systems would require a large amount of capital—more than the individual landowner could command—and the drainage of these large tracts will have to be accomplished by syndicate, by cooperation of individual landowners, or by State aid.[a] Companies have bought up large tracts of this phase of Swamp and expect to drain portions of them, which, when accomplished, will open up some of the finest corn and cotton lands in the eastern section of the State.

The forest growth varies greatly in different pocosons, and even in the same pocoson, and is commonly taken to indicate the agricultural value of the soil. In some areas there is a heavy growth of gum,

[a] It might be well for those interested to consult the revised drainage laws of Ohio. See also Field Operations of the Bureau of Soils, 1902, pp. 396 and 418.

cypress, juniper, and bay, while in others only a few scrubby, scattering pines occur. The character of the undergrowth is such as to render it next to impossible to get into these swamps except where an occasional path has been cut by lumbermen, and even in such cases it is necessary to employ a guide. As one proceeds inward he finds that the undergrowth, which in the heavily timbered areas consists usually of a thick growth of gallberry and fetter bushes, swamp ivy, and similar shrubs, is less dense in some places than in others. Where the undergrowth is thickest it would take one man a day to cut his way for a single mile. This heavily timbered pocoson is considered the best quality of the Swamp, and when drained and cultivated it will yield in good seasons from 35 to 75 bushels of corn per acre.

The soil here consists of a black or brownish spongy mass of vegetable matter, in various stages of decomposition, with which there are mixed different proportions of fine earth, so fine that particles are scarcely noticeable to the naked eye. The percentage of organic matter is usually very high, sometimes amounting to as much as 90 per cent, or even more. The soil is usually filled with water, although in very dry weather it sometimes catches fire and burns to a depth of a foot, or even more. The depth of this organic deposit varies from 1 foot to 3 feet, sometimes exceeding the latter figure, being usually thinner near the outer edges and upon the low ridges. It is underlain by a clay or sandy clay, not very different from the subsoil of the Norfolk fine sandy loam. It varies, however, being in some places more porous than in others. The greater part of the Big Pocoson is heavily timbered.

There is another phase of the Swamp of pocoson type which is locally known as "brier pocoson" or "gallberry land." This is not heavily timbered, but has only a scattered growth of pines, beneath which is a thick undergrowth of gallberry and other bushes, broom sedge, and wire grass, woven together with running briers. Upon a cursory examination the soil here does not appear to be very different from that described above, but when exposed to rains, as by roadsides or where ditches have been cut through it so as to expose a section of 1 or 2 feet, it has a grayish look from the presence of the white marine sand which has been exposed by washing. The percentage of organic matter is lower and the soil is less peaty and more sandy in character than where heavy timber is present. When first cleared it produces fairly well for two or three years, but after that time becomes more compact, harder, and almost unproductive. A large part of the Dover Pocoson is known as "gallberry land."

That a great difference exists in the productiveness of these two phases of the Swamp of the pocoson type has been known for many years (see Report of North Carolina Geological Survey, 1858), but the

reason for so marked a difference is not apparent from any peculiarity noticeable in the field.

A very small percentage, indeed, of this type of Swamp is under cultivation. Where the timber has been cleared, and the soil drained, aerated, and limed, yields of 35 to 75 bushels of corn are not uncommonly obtained in good seasons. All of the soils of these areas are "sour," and lime should be used as a corrective.

A second variety of the Swamp includes the bottom lands along the smaller streams and slow drainage ways reaching far into the upland. Such areas invariably lie above tide water, and are found at all elevations up to a height of 60 feet or more.

The texture of the soil of these areas varies considerably, but in the majority of cases it is that of a rather mucky, black sandy loam, 1 or 2 feet in depth, beneath which is a plastic sandy clay, which is usually stained dark by organic matter, though a mottled gray and yellow color is also found.

The surface of these areas of Swamp is rather flat. The soil is frequently wet nearly the whole year through, but it can be reclaimed in many instances by cleaning out and deepening the course of the naturally sluggish drainageways. This is now being done to some extent.

The phase owes its origin to materials washed in from the uplands and deposited by drainage waters, mingled with decayed vegetable matter accumulated during the centuries through which it has been subjected to swampy conditions. The relatively great proportion of organic matter gives the soil its mucky characteristics.

A very small proportion, possibly 4 per cent, of this phase of Swamp is at present under cultivation. Artificial drainage is always a necessary preliminary to cultivation, and in some cases drainage systems have been constructed. Where drained the soil produces fine crops of corn, cotton, hay, and late truck, although there is a tendency to rankness of growth. In some parts of the United States such a soil is well adapted to the growing of celery, and this crop could, no doubt, be successfully and profitably produced in the Craven area. The uncultivated tracts are covered with a forest growth of gum, ash, water oak, and cypress, and an undergrowth of shrubbery and swamp grass. They form wild pasturage for cattle and hogs during the greater part of the year.

The third variation in the Swamp, so far as texture and origin are concerned, is almost identical with the second. The main difference is that the former lies at the level of tide water, or only 1 or 2 feet above, and is therefore subject to standing water during most of the year. This water is often brackish, and the vegetation differs somewhat from that of higher lying swamp areas, consisting more largely of cypress, shrubbery, swamp grasses, and other plants of water-

loving species. The phase is limited entirely to the lower courses of the Neuse and Trent rivers and the areas next the rivers consisting of open marsh land, over which the water usually stands to a depth of not less than 6 inches.

Some areas of the open marsh afford pasturage for cattle, but not for other farm animals. The coarse grass also makes a fair quality of hay, but since the footing does not allow the use of heavy machinery most of the work has to be done by hand, even to the removal of the hay to higher ground. The forested areas afford good range for all kinds of live stock during the portion of the year when they are not overflowed.

When the area becomes more thickly settled and agricultural lands more valuable, this character of land may be reclaimed profitably and used for growing grass or some cultivated crop. Such land in New Jersey has been diked and made very productive.

AGRICULTURAL METHODS.

Until recently cotton has been grown continuously on the same land from year to year, and little attention has been given to diversification of crops or to the betterment of the soils. Recently there has been a marked change in this particular, and many farmers are practicing rotation of crops, introducing new crops for direct profit or for the purpose of improving the soils.

A quite common plan of rotation is, first, corn, in which cowpeas are sown after the last cultivation or about the middle of July; second, cotton; third, grain or forage crops, such as corn for fodder, cowpeas, etc. The following year the rotation begins again with corn. This scheme is easily varied to suit the introduction of tobacco or some truck crop, which may well follow corn or cotton, the clean cultivation of these crops leaving the soil comparatively free from weed seed and in good tilth generally.

It is not uncommon in the trucking areas in this region for two, three, or even four crops to be grown in a single season. For example, sweet corn is often followed by Irish potatoes, and these by turnips or cabbage, the latter growing all winter and only on rare occasions being injured by frost.

The growing of winter crops of lettuce, onions, spinach, etc., in cold frames or in beds covered with cotton cloth and artificially heated and watered has been found profitable around Newbern. Such products bring high prices in the New York and other northern markets.

AGRICULTURAL CONDITIONS.

The agricultural resources of the area are as yet largely undeveloped. The country in general is rather thinly settled, and in some sections there are large areas where one can travel for miles without

seeing a single dwelling. There are other sections, however, in which most of the land has been cleared and is well cultivated and where many evidences of thrift and prosperity are seen.

The areas whose resources have been least developed are situated at some distance from the navigable streams and the railways, and this fact would seem to indicate that the lack of transportation facilities has done much to retard the development of these sections. Their development has also been hindered by the presence of large swamps, the drainage of which would require too great an expenditure of money to be undertaken by the individual farmer, even where it is admitted that such drainage would be profitable. Besides the pocosons, there are large tracts of land which are covered with a thick growth of pine. This consists now chiefly of the shortleaf pine, a variety now considered more valuable for lumber than the longleaf, which was formerly much more abundant. The largest tracts of pine timber lie in the northeastern section of the area, where there are many thousand acres of land covered with an almost unbroken forest, but smaller areas are found in other sections. Companies have been formed for the marketing of this timber, and millions of feet of it are hauled to the streams and rafted to Newbern, where it is sawed into lumber.

The great activity in the lumber business has attracted many of the farmers from agricultural pursuits. The employment of a large number of men in lumbering has also made it more difficult for the farmers to get laborers, and has caused an advance in the price of labor.

Probably 75 per cent of the area is yet uncultivated. A very large proportion of the cultivated land lies within a few miles of the navigable streams and railways. The price of land depends very much upon the state of improvement, transportation facilities, and distance from the towns, as well as upon its natural productiveness. Many of the best farms are worth from $15 to $30 an acre, or even more, but the average price is not far from $10 an acre. The value of the timber land depends upon the amount of timber upon it, but will probably average about $5 an acre.

The improvements upon the farms vary in different localities. They usually consist of a dwelling house, barn for stable purposes, wagon and tool sheds, tobacco barns, and upon the larger plantations tenant houses and often a cotton gin. Upon some of the best farms these structures have been erected at considerable cost, but usually they are not very expensive. The tobacco barns are built of logs and are made tight by chinking and daubing with clay. They are from 16 to 22 feet square, are fitted with flues, and (as a protection in case of fire) are never placed nearer to each other than 100 feet. Some of the larger plantations have as many as a dozen of these barns, which, when properly constructed with flues complete, cost from $50 to $75 each.

Except along the larger streams where the stock law prevails, fences must be maintained at considerable expense to the landowner. Modern machinery has been introduced and promises to be much more extensively used. There is very little improved stock in the area, but more of it is being brought in, especially where the stock law is in force. In other areas the stock are allowed to run at large.

According to the Twelfth Census, about 46 per cent of the farms are operated by owners or part owners, of whom about one-fifth are colored; between 9 and 10 per cent are operated by cash tenants, of whom less than half are colored; and 44 per cent are operated by share tenants, of whom a little over half are colored. In addition to these, a few farms are operated by managers, and this class is believed to be on the increase.

One of the most striking features presented by these figures is the large proportion of farms operated under the tenant system, especially on the share basis. The cash tenant usually pays a rental of from 75 cents to $2.50 an acre, the rate being determined largely by the location and the productiveness of the land. The share tenant usually gives one-third of the corn and one-fourth of the cotton, including the seed, to the owner of the land, if the horses and tools are supplied by the tenant, while if supplied by the landowner, about one-half of the crop is given. A State law enables the landlord and tenant to enter into a contract in which the kind of crops and the number of acres of each crop to be grown are specified. It is also provided that in case the tenant deserts his crops, or fails properly to care for and harvest them, the landlord may take full possession. Usually there is a clause in the contract which provides for the advancement by the landlord to the tenant from time to time of money and supplies up to a certain limit, all being charged as a lien on the crop. The tenant system is not conducive to the maintenance or improvement of the productivity of the farms, and a change in the practice is desirable.

The population of the area averages only about 34 inhabitants per square mile. Of this number about one-third are on farms, the remainder being engaged in lumbering or mercantile pursuits and the professions. About half the population is colored. The average size of the farms of this area, as nearly as can be computed from the Twelfth Census returns, is 107 acres. There are some tracts of from 500 to 2,000 acres, but by far the greater number contain between 50 and 300 acres. About 34 per cent of the farm acreage is under some form of cultivation.

Complaints of the scarcity of farm labor were heard throughout the area. Both white and colored labor is employed, and for the cotton crop the latter is considered as capable as the former. In the handling of tobacco, where more skill is required, white labor is pre-

ferred. The average wage paid is about 50 cents a day. Some of the more progressive farmers are meeting the labor difficulty by using more labor-saving machinery, and, while laborers of greater ability are needed to handle such machinery and a higher wage must be paid to secure such help, it is found to be economical in the end. Laborers of this latter class are much more dependable, the risk of being left without help at critical periods is provided against, and the farmer is enabled to lay his plans accordingly. Foreign laborers are also coming into the area in greater numbers than formerly and this is improving the labor situation to some extent.

The commodities produced for export in the Craven area are lumber, cotton, corn, tobacco, live stock, and, in the vicinity of Newbern, the truck crops. Excepting lumber, cotton and tobacco are of greatest importance. The value of the annual output of lumber is estimated at about $1,500,000, and that of the 12,000 bales of cotton at about $500,000. A price of from 8 to 14 cents a pound was secured for cotton this year (1903), which nets the farmer a very good profit. The cotton is picked largely by hired labor and hauled to the gin, where the seed are separated from the lint. The cost of ginning is about one-fourth of a cent a pound. Many of the farmers do their own ginning, but there is a tendency toward fewer but larger and better gins.

Ever since the settlement of the country corn has been one of the leading crops. The total production has, however, never been very large.

The value of the tobacco crop varies considerably from year to year, according to the change in prices, but it approximates $1,000,000 annually. During 1902 the average price per pound was about 12 cents, while in 1903 it was about 6 cents, the difference being due in part to difference in quality.

The production of bright tobacco has increased very rapidly since its introduction into this section of the State, and as it has brought into use again lands which were before considered of little value its influence upon the agricultural condition of the area has been quite marked. The tobacco grown is a bright yellow variety, which is used in the manufacture of cigarettes and smoking tobacco, and also as a plug wrapper. The planting season is usually from May 10 to June 10. When from 8 to 12 leaves have been developed the tobacco is topped, and the plant is suckered every week if necessary. The usual method of harvesting the crop is to remove each leaf separately as it becomes ripe, leaving the others to ripen further. Sometimes the entire stalk is cut. The former method has a decided advantage, as all the leaves never ripen at the same time. The tobacco is carried then directly to the barns, where it is cured by artificial heat. Three days are needed to cure a crop, and considerable skill is necessary to

cure it properly. The tobacco is then taken out, bulked down, or carried loose to the warehouse, where it is sold in the open market.

The value of the live stock of the area, according to the last census, was about $500,000.

The development of the trucking industry has also had an important influence upon the agriculture of this section. The lack of rapid transportation facilities prevents the growing of truck in some sections where the soil is well adapted to it, but there seems to be no reason why these crops should not be grown for canning, even where the lands are not very near the railroads. Newbern is the center of the trucking interests, and the annual value of the produce shipped to outside markets is approximately $200,000. Large quantities of cabbage, lettuce, and sweet and Irish potatoes are produced and shipped to New York and other northern markets.

The production of forage crops is being increased, and more corn is being grown solely to supply food for cattle. Corn binders and shredders are coming into more general use, doing away with the wasteful and laborious methods formerly employed in harvesting this crop, when much of the stalk was allowed to remain in the field.

Fruit growing is not engaged in very extensively. This, as a rule, is not a good apple country. The pear does better than any other of the orchard fruits. Many varieties of the grape flourish, and vineyards were noted upon most of the farms. This is the home of the Muscadine or Southern fox grape, the best known variety being the Scuppernong. The annual value of fruits, principally berries, produced in the area, approximates $10,000. That there is much room for extension of the fruit interests, as well as of all the other industries mentioned, is evident. There is also an apparent opportunity for an increased production of live stock.

The crop adaptabilities of the several soil types have already been mentioned in the discussion of each type, but a brief review is here presented, to bring out more particularly this important feature.

The Norfolk sand is best adapted to truck crops. Usually in growing these crops large quantities of manure and fertilizers are used. The type is inclined to be droughty, unless it happens to lie near sea level, or in a position where the water table is near the surface, and irrigation is desirable where it can be economically supplied. Where manure is added in abundance and the soil water is sufficient, some excellent yields of the staple crops are secured, but such locations are rare.

The Norfolk sandy loam is also a good truck soil, but it has the advantage of being as well adapted to staple crops, such as cotton, corn, and tobacco. Tobacco gives particularly good yields of a leaf of fine quality. The sandy clay subsoil holds moisture well, and yet

is not too stiff for crops that root deeply. Both small fruits and certain of the tree fruits thrive on this type.

The Norfolk fine sandy loam, aside from Swamp, is the soil of greatest extent in the area, covering about 27 per cent of the land surface. It is also one of the most important types, by reason of its adaptability to nearly all the crops that are suited to the climatic conditions of the section, and because of its ease of tillage under a remarkably wide range of moisture conditions. It can produce an average yield of a bale or more of cotton per acre, while the highest yields—800 to 1,600 pounds per acre—of tobacco are secured on this type. The fruits, especially strawberries, grapes, pears, etc., do well on this soil. The sandy loam soil, with its clay subsoil, seems very well adapted to conserve moisture for the use of crops.

The Selma clay is not very extensive. It is better suited to cotton, corn, grain, and forage crops than it is to truck crops. Unless carefully handled it is rather refractory, being disposed to bake into a hard crust in dry weather. Good yields of the staple crops are secured where the land is kept in good tilth by manuring and thorough cultivation of the surface.

The Neuse clay is at present largely forested, and is used as wild pasture for live stock. When cleared and drained it produces large yields of the staple crops, such as cotton, corn, and forage crops.

The Portsmouth sand, which is similar in texture to the Norfolk sand, is adapted to truck crops, but by reason of its larger humus content and rather better moisture conditions, it is somewhat better suited to the growing of staple crops.

The Portsmouth sandy loam, when properly drained, is well adapted to the growing of cotton, corn, and forage crops. It is naturally very productive, having always a comparatively large proportion of organic matter. When well drained and cultivated, truck and fruit crops also produce well. This type is naturally considerably more productive than the Norfolk sandy loam, to which it has some textural similarity.

The Portsmouth clay, differing from the Norfolk fine sandy loam mainly in having poorer drainage and a higher humus content, where drained is well adapted to the staple crops. It is also adapted to truck and fruit crops. The type is naturally productive.

The pocoson phase of the Swamp is largely in a wild state, being covered with a heavy or scattered growth of forest trees, and an undergrowth of gallberry bushes, briers, and swamp grass. In this condition it is used mainly as a run for hogs and cattle. If cleared and drained, in most cases cotton, corn, and forage crops can be produced, and the productiveness of a great part of it is undoubted. Other areas are peculiar in that they become nonproductive after one or two seasons' cultivation. Drainage of the type, as a whole, would be too large an undertaking for individuals. Either corporate or State

aid would have to be employed. The other variations of Swamp are even less developed than the phase just described, but are capable of producing crops when reclaimed.

Good transportation facilities are afforded by the railways crossing the northwestern and southeastern sections of the area, while the larger streams are navigable for small vessels and furnish outlets for the products of the areas through which they flow. None of the wagon roads are macadamized, and in fact the majority of them have received very little attention of any kind. Within the area there is no stone available for macadamizing purposes, but the roads could be improved by hauling sand where clay predominates, and clay where the roads run through deep sands. The low, miry places have been cross laid with small, split pine poles.

The outside and distant markets, like New York City and others, are reached by water and rail from the more favored parts of the area, and the development in these parts is far in advance of that in the country more remote from the railroads and larger streams. The local markets are not very important, though the large number of laborers engaged in lumbering create a considerable demand for farm produce. Newbern is the principal point for shipment of cotton and tobacco, the other smaller towns acting chiefly as local depositories for Newbern. Kinston and Goldsboro, which are not far to the westward of the area, are also noted as shipping points for cotton, tobacco, and truck, these places being among the leading tobacco markets of the State.

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SOIL MAP
NORTH CAROLINA
CRAVEN SHEET

N C DEPT OF AGRICULTURE
S L PATTERSON COMMISSIONER
B W KILGORE STATE CHEMIST

77°30' 25' 20' 15' 10' 5' 77°00'
35°30' 25' 20' 15' 10' 5' 35°00'

SOIL PROFILE
(3 feet deep)

Norfolk sand — S
Portsmouth sand — S
Norfolk sandy loam — Ssc / C
Portsmouth sandy loam — Ssc / C
Norfolk fine sandy loam — Ssc / S
Portsmouth clay — Ssc / Scc
Selma clay — Ssc / Scc
Neuse clay — Sicc / C
Swamp

LEGEND

S Sand
Ssc Sandy loam
S Sand and clay
Sfs Fine sandy loam
Scc Clay loam
Sicc Heavy silt loam
C Clay

LEGEND

Ns Norfolk sand
Ps Portsmouth sand
Nl Norfolk sandy loam
Pl Portsmouth sandy loam
Nsl Norfolk fine sandy loam
Pc Portsmouth clay
Sc Selma clay
Nc Neuse clay
S Swamp

Soils surveyed by
William G. Smith and George N. Coffey
1900-1903.

BASE MAP FROM
U S GEOLOGICAL SURVEY SHEETS

Scale 62500
Miles
Kilometers
Contour Interval 10 feet

Field Operations
Bureau of Soils
1903.